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Guidelines for Running GRASS Benchmarks

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by
Mark O. Johnson

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The Geographic Resources Analysis Support System (GRASS) is a geographic information and image processing system originally designed to serve land managers and environment planners at Army installations. GRASS is public domain software distributed by several public and private organizations. Consequently, there are many different hardware configurations running GRASS. This guide documents current procedures used to conduct system performance tests (benchmarks), to provide users considering the acquisition of the system a reliable means to compare the many systems that run GRASS. Relevant data that accompany benchmark results are: machine specifications; system environment; GRASS program environment; GRASS graphics environment; operation descriptions; data description; and benchmark execution notes.

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Johnson, Mark O.

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U.S. Army Construction Engineering
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The Geographic Resources Analysis Support System (GRASS) is a geographic information and image processing system originally designed to serve land managers and environment planners at Army installations. GRASS is public domain software distributed by several public and private organizations. Consequently, there are many different hardware configurations running GRASS. This guide documents current procedures used to conduct system performance tests (benchmarks), to provide users considering the acquisition of the system a reliable means to compare the many systems that run GRASS. Relevant data that accompany benchmark results are: machine specifications; system environment; GRASS program environment; GRASS graphics environment; operation descriptions; data description; and benchmark execution notes.

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FOREWORD

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GUIDELINES FOR RUNNING GRASS BENCHMARKS

Mark O. Johnson

U.S. Army Construction Engineering Research Laboratory
P.O. Box 4005
Champaign, IL. 61824-4005

ABSTRACT

The purpose of the report is to document the current procedures used to conduct system performance tests (benchmarks) for computers running the Geographic Resources Analysis Support System (GRASS).

1. Introduction

The purpose of the GRASS benchmarks is to provide would-be users with a general means of comparison between the many systems now running GRASS. This information will be used to compile and update the *GRASS Hardware Configuration Guide*[1] and will be featured in the quarterly issues of *GRASSClippings*.[2] It should be stressed that speed is not the sole factor in deciding what system best suits a user's needs. Other factors to consider include, but are not limited to, system price, cost and responsiveness of hardware and software maintenance services, system limitations, and upgrade capabilities.

2. Documenting Machine Specifications

The following information should be provided with the benchmark results to describe the system being tested. A form is provided to record this information. When completed you should send the form to the above address.

System Name

Industry name, model number, etc..

Configuration Price

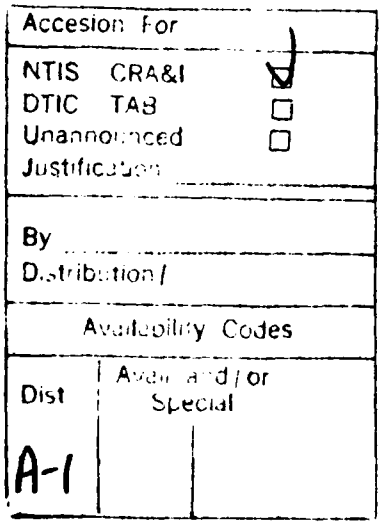
List price of system configuration being tested.

Processor

What type (68030,80386,..) and how many.

Floating Point Processor

What type (68881,...) if any.



[1] Douglas A. Brooks, Michael E. Higgins, and Mark O. Johnson, *GRASS Hardware Configuration Guide*, ADP Report N-89/21 (U.S. Army Construction Engineering Research Laboratory [USACERL], March 1989).

[2] *GRASSClippings*, ISSN 0899-7853, published quarterly by the GRASS Inter-Agency Steering Committee.

Memory

Amount (in megabytes) of RAM memory installed.

Maximum amount (in megabytes) of RAM memory expansion possible.

Disk Brand, Size, and Access Speed

Brand name of disk (Fujitsu, Hitachi,...)

Disk size (in megabytes)

Disk access speed claimed by manufacturer (in microseconds [ms]).

Clock Speed

CPU speed in megahertz (Mhz).

Graphics System

Description of graphics system including, but not limited to, such things as industry known name, number of planes, number of buffers, number of colors supported (palette & displayable). This will be condensed to fit space available.

Screen Resolution & Size

If the full screen will be used as the graphics window specify screen resolution. If using a sub-window for graphics, specify the size (in pixels) within the sub-window.

3. Setting up System Environment for Benchmarks

The purpose of these tests is to determine what a normal user should expect in terms of response time.

The following conditions should be maintained during testing:

- NO SYSTEM OPTIMIZING: ALL normal system daemons and processes should be active.
- NO OTHER USERS: Be sure you are the sole user of the system during testing. We don't want to measure swap time between you and another user. However the system should be in multi-user mode.
- SYSTEM SHELL: Use whatever shell (csh,sh,..) users are normally expected to use. Most users tend to use the csh-shell if available. Please document your choice on the form provided.

4. Setting up GRASS Environment for Benchmarks

Enter the GRASS system, selecting **spearfish** as your location and any name you choose as the mapset. Once you have a GRASS system prompt enter the following command:

```
Gwindow default print
```

This will set the area of interest and the resolution to match those of the spearfish locations default settings. You should see a confirmation like this:

Mapset < benchmarks> in Location < spearfish>
GRASS-GRID > Gwindow default print

projection:	1 (UTM)
zone:	13
north:	4928000.00
south:	4914000.00
east:	609000.00
west:	590000.00
nsres:	100.00
ewres:	100.00
rows:	140
cols:	190

5. Setting up GRASS Graphics Environment for Benchmarks

When setting up the graphics environment, be sure your graphics window covers the entire screen. If you're running the graphics driver within a window management system (suntools,X,...) either make the graphics window fill the screen or document the size (in pixels) of the graphics window.

6. Operation Descriptions

These are the commands to be used for benchmark testing. It is assumed that no modifications have been done. Any modifications should be completely documented and returned with the benchmark results.

1) Dcell - A raster data display function involving disk I/O and raster output which is used to fill the computer graphics screen with a data layer.
2) Gstats - Program involving disk I/O and up to 4 byte integer operations to calculate the frequency of common occurrence of categories between one or more data layers.
3) Dvect - A vector display function involving disk I/O and vector output which is used to draw vector lines from a data file to the computer graphics screen.
4) Gslope.aspect - Program to create slope and aspect data layers from an elevation data layer involving disk I/O and floating point computation.

7. Data Description

The data layers **geology** and **elevation** will be used in performing tests 1,2,& 4. The **geology** data layer has a resolution of 100 x 100 meters. The **elevation** data layer has a resolution of 30 x 30 meters. **DO NOT RESAMPLE** the **elevation** data layer to fit the 100 x 100 meter window. The vector file **roads** will be used for the Dvect benchmark.

8. Benchmark Execution Notes

The UNIX command **time** will be used to measure the speed at which the program was executed. This command returns several measurements depending on the version of UNIX and the type of shell (sh or csh) being used. The tester should record the entire line returned by the time command.

9. Benchmark Execution

The following represent examples of benchmark execution for each test program.

9.1. Dcell

```
Mapset < benchmarks>  in Location < spearfish>
GRASS-GRID >  time Dcell elevation
3.3u 3.4s # :# #  15% 31+ 26k 294+ 53io 0pf+ 0w
```

9.2. Gstats

```
Mapset < benchmarks>  in Location < spearfish>
GRASS-GRID >  time Gstats geology elevation >  gstat.out
3.3u 3.4s # :# #  15% 31+ 26k 294+ 53io 0pf+ 0w
```

9.3. Dvect

```
Mapset < benchmarks>  in Location < spearfish>
GRASS-GRID >  time Dvect roads
3.3u 3.4s # :# #  15% 31+ 26k 294+ 53io 0pf+ 0w
```

9.4. Gslope.aspect

```
Mapset < benchmarks>  in Location < spearfish>
GRASS-GRID >  time Gslope.aspect elevation= elevation slope= s.test aspect= a.test
3.3u 3.4s # :# #  15% 31+ 26k 294+ 53io 0pf+ 0w
```

The tester may want to remove the cell files created by Gslope.aspect (s.test, a.test) and the file created by Gstats (gstats.out).

GRASS BENCHMARK INFORMATION SHEET

System Information

System Name

Configuration Price

Processor

Floating Point Processor

Memory

tested system amount:
maximum amount:

Disk Brand, Size, and Access Speed

Disk brand name:
Disk size:
Disk speed:

Clock Speed

Graphics System

Screen Resolution & Size

Shell of Choice

Other System Information

Description of other standard system features which come with system as priced (ethernet, racksize, number of expansion slots, tape systems, manuals).

Benchmark Results

Mapset < benchmarks> in Location < spearfish>
GRASS-GRID > time Dcell elevation
Enter complete time results here:

Mapset < benchmarks> in Location < spearfish>
GRASS-GRID > time Gstats geology elevation > gstat.out
Enter complete time results here:

Mapset < benchmarks> in Location < spearfish>
GRASS-GRID > time Dvect roads
Enter complete time results here:

Mapset < benchmarks> in Location < spearfish>
GRASS-GRID > time Gslope.aspect elevation= elevation slope= s.test aspect= a.test
Enter complete time results here:

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Washington, D.C. 20013

U.S. Dept of Commerce
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NOAA
Boulder, CO 80303

U.S. Geological Survey
Reston, VA 22092

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